

## GREEN HOME SECURITY SYSTEM

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This report is submitted in partial fulfillment of requirement for the Bachelor Degree of  
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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
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**BORANG PENGESAHAN STATUS LAPORAN**  
**PROJEK SARJANA MUDA II**

**Tajuk Projek** : **Green Home Security System**

**Sesi Pengajian** : 

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*Specially dedicated to my beloved parents and family, for their encouragement and support; my friends who always inspired and motivated me along my excellent journey of education*

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## ABSTRACT

This project is about designing and building a Green Home Security System using the GSM method. It consists of two subsystems, the first is the home security system. In this system, an Arduino Microcontroller is considered as the heart of the project as it is used to combine all the other components used. A motion sensor and a temperature sensor are connected to the Arduino and both of them give the input to the system. For the output part, a piezo buzzer and a GSM module are used. Arduino has an in-built analog to digital converter (ADC) which reads the signals from the sensors and produces the output in form of sound through the piezo buzzer and text messages through the GSM module. The idea of the system is that; the Arduino will keep configuring the sensors until an obstacle is detected, and once it does, the piezo alarm will start, and a text message will be sent to a desired number that can be set from the coding of the system. The second part is the solar power system, which is considered as the power supply of the Home Security System. In this system, a 20-watt solar panel is used to generate power with a maximum input voltage of 18V. This project can be used in houses, offices and many more places, and the use of it gives a great level of security, and thus, a peace of mind to the owner, as the system will keep notifying the owner about any case inside the house.

## ABSTRAK

Projek ini berkonsepkan rekaan dan pembinaan Sistem Keselamatan Rumah Mesra Alam yang mengimplikasikan penggunaan GSM. Projek ini mengandungi dua sub-sistem, pertama ialah sistem keselamatan rumah. Didalam sistem ini, penggunaan Arduino Microcontroller dianggap sebagai jantung projek dalam menghubungkan kesemua komponen yang digunakan. Pengesan pergerakan dan pengesan suhu dihubungkan ke Arduino dan kedua-duanya sebagai sumber untuk sistem projek ini. Untuk bahagian keluaran, buzer piezo dan GSM modul digunakan. Arduino mengandungi penukar analog kepada digital (ADC) dimana ia akan menganalisis isyarat daripada pengesan-pengesan dan menghasilkan bunyi melalui buzer piezo dan pesanan meseg menerusi GSM modul. Secara keseluruhannya; Arduino akan memastikan pengesan berfungsi sehingga halangan dikesan dan jika halangan dikesan, buzer piezo akan mula berbunyi lalu pesanan meseg akan dihantar ke nombor yang telah ditetapkan melalui kod dalam system ini. Bahagian kedua ialah sistem kuasa solar, dimana ia boleh dianggap sebagai sumber kuasa untuk Sistem Keselamatan Rumah. Di dalam sistem ini, 20 Watt solar panel digunakan untuk menjana kuasa dengan kuasa maksimumnya adalah 18V.



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## CHAPTER I

### INTRODUCTION

#### 1.1 Project Background

A couple of years ago, people started finding ways to protect their houses and offices until the day in which the home security system was invented. A home security system is a device that is capable of securing homes by using different methods. The most known methods are the GSM based home security system, Bluetooth based home security system and many different methods. Nowadays, it has been very important for everyone to have a security system in the house to protect the valuable stuff as robberies cases are increasing day by day.

In this project, the GSM method will be used to build a green home security system. A solar panel will be used to generate power to the system. The system consists of an Arduino Microcontroller connected with a GSM module, a motion sensor, a Temperature sensor and an alarm buzzer. The system will have a direct contact with the owner, via the GSM module used, which is the SIM900A Mini. The sensors will sense the surrounding area, so in case of detection of any unusual movement or fire, the phone will send a text message to a desired number informing the owner about the case.

#### 1.2 Problem Statement

As a person coming from a country where the availability of electricity is still a problem, solar power might be one of the solutions for this problem. By using solar panel

power, a home security system can be built to protect our homes from robberies, and the amount of electricity and money spent can be reduced. Moreover, in case of power outage, the security system will stop operating, so solar power will solve this problem.

### **1.3 Objectives**

1. To build a system that can secure our homes and offices from robberies by using the GSM method.
2. To save electricity and money by using solar power, and support the idea of using Eco-Friendly sources.

### **1.4 Scope of Project**

The main scope of this project is to build a home security system using solar panel power. A solar panel will be used to generate power to the security system. The system will be Arduino based, with the use of the GSM technology. The use of GSM may give connections between a smart phone and the security system that will be equipped with a motion sensor a fire sensor and an alarm buzzer. The motion sensor is to sense any unusual motion in the house and the fire sensor is to detect the rapid increment of the temperature. In case of any unusual action in the house, the phone will automatically send a message to a desired number to inform the owner about the case. All the things will be programmed using an Arduino microcontroller.



## 1.5 Project Outline

Chapter 1 which is the introduction is mainly about clarifying the idea of the project, defining the problem statement, objectives, and scope of the project. This chapter is considered as the most important chapter in the report, as it acts as the base of the report. Chapter 2 focuses on the literature review which is all about comparing between different methods of making home security systems, and previous methods to have a better and clearer understanding about the project. Chapter 3 is the methodology part. In this part of the report, the methodology used in the project is clearly discussed. This part is to draw an outline of how the system of the prototype should operate. Chapter 4 will mainly be about the results obtained and the discussion. Finally, chapter 5 will be about the conclusion and future recommendation.

## CHAPTER II

### LITERATURE REVIEW

#### 2.1 Introduction

Home security systems can be built using different methods and methodologies, so in this part of the report, some of these methods will be discussed to have a better understanding and to ensure the best method is selected to complete this project. Bluetooth technology, Global System for Mobile Communication (GSM) technology and Internet of Things (IoT) technology will be discussed. Arduino Microcontroller, Galileo Microcontroller and ATmega8 Microcontroller are all used with these technologies. Moreover, all the components used to build a home security system will be discussed in this chapter.

#### 2.2 Theoretical Background

In this part of the report, all the components used to build the Green Home Security System was discussed and analyzed, such as Motion sensor, Temperature sensor, Arduino Microcontroller, GSM Module (SIM900A Mini), Piezo Buzzer, Solar Panel, SLA battery, and Solar Charge Controller.

i. Motion Sensor:

Passive infrared sensor (PIR) is capable of sensing the motion in the surrounding area with a range of around 6 meters. It is usually used in home security systems to detect the

intruders. It is small, easy to use and inexpensive. It is made of Pyroelectric sensors which can detect the level of infrared radiation. PIR is a rectangular shape and requires power supply of around 3V-9V, but 5V is ideal. An example of a motion sensor is shown in Figure 2.1 (Motion sensor) [1].



Figure 2.1 Motion sensor

ii. Temperature Sensor:

Temperature sensor LM35 is a precise integrated circuit temperature device with an output voltage proportional to the Centigrade temperature. The low cost, low output impedance and linear output of the LM35 makes it the most common used of its type [2]. LM35 has a low self-heating range of lower than  $0.1^{\circ}\text{C}$  in still air, because it draws only  $60\mu\text{A}$  from the supply and it operates from  $-55^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  temperature level. An example of a temperature sensor is shown in Figure 2.2 (Temperature sensor) [3].

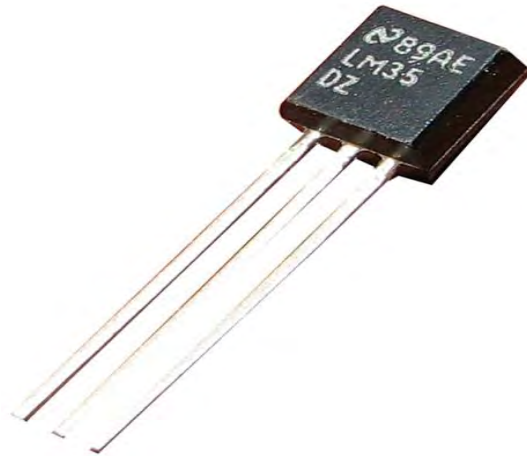


Figure 2.2 Temperature sensor

iii. Piezo Buzzer:

These days, it seems that we are constantly being alerted with everything from beeps to buzzers. Alarm buzzers are considered as one of the most important parts of our daily life, as they have variety of applications, such as security systems, and medical equipment. In some applications, a person's life may depend on an alarm buzz, and this shows the importance of this device. Piezo buzzers have a wide operating voltage of 3~250V, lower current draw of less than 25mA. An example of a Piezo Buzzer is shown in Figure 2.3 (Piezo Buzzer) [4].



Figure 2.3 Piezo Buzzer

iv. Arduino Uno:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started [5]. It features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. the current draw of the Arduino Uno is only 50 mA, which is great in the case of using solar power. Figure 2.4 (Arduino Uno) Shows an example of Arduino Uno [6].

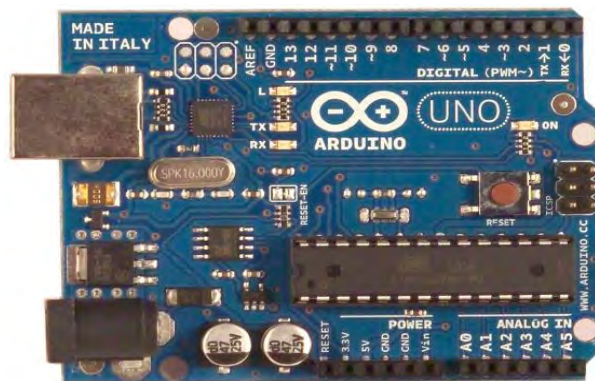


Figure 2.4 Arduino Uno

v. GSM Module (Sim900A Mini):

The SIM900a Mini is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. Figure 2.5 (GSM Module) shows an example of a GSM Module [7].



Figure 2.5 GSM Module

vi. Solar Power:

The word “solar” is a Latin word and it means “Sun”. Every day, the sun radiates a huge amount of energy. The energy radiated by the sun in one day is enough to be used by the world in one year. Solar power is free, clean, eco-friendly, and the most abundant renewable energy source available [8]. These are some of the reasons why people should start using it in their lives. An example of a solar power cell is shown in Figure 2.6 (Solar panel) [9].



Figure 2.6 Solar panel

vii. Solar Charge Controller:

A solar charge controller is a device used to monitor the charging process of a battery connected to a solar panel. The main function of this device is to control the amount of current used by the battery. Moreover, it prevents overcharging and fluctuation of voltage level, which can affect the battery performance and lifetime. Figure 2.7 (Solar Charge Controller) shows an example of Solar Charge Controller [10].



Figure 2.7 Solar Charge Controller

viii. Sealed Lead-Acid (SLA) Battery:

SLA batteries are maintenance free rechargeable batteries. They have great stability, superior output and leakage proof. They have the ability of preventing overcharging and over-discharging, but sometimes it mistakenly overcharges the devices [11]. It is portable and available in variety of sizes. Figure 2.8 (SLA Battery) shows an example of an SLA battery [12].



Figure 2.8 SLA Battery

### 2.3 Previous Related Work

In this part of the report, a comparison between some related previous work will be done to have a better and clearer understanding about home security systems and the various methods used to build it.

i. Home security and automation using Bluetooth Technology:

In this paper, a home automation and security system is designed using Bluetooth technology, but only the security system part will be discussed. The system is controlled by sending SMS through Bluetooth network. An Arduino microcontroller is used to interact with the sensors like fire, motion and smoke sensors. Whenever any of the sensors detects something, a text message will be sent to the owner's phone number. Java script language is used for the coding of the system [13]. The only problem with this project is the use of Bluetooth technology, because Bluetooth is very well known for poor security and slow data transmission [14].

ii. Smart home security system using GSM technology:

In this paper, two methods are suggested. The first is using web camera. A camera is installed in the house premises, so whenever the camera detects something, an e-